

Final Technical Report for the Project:  
**ASSERT: Observation and prediction of the nonlinear evolution of  
shoaling surface gravity waves, N00014-95-1-0730**

The two graduate students supported by this AASERT project completed their studies and were awarded PhDs. Dr. Barry Vanhoff received a PhD from Washington State University for his studies of techniques to simulate time series of nonlinear ocean surface waves. He showed that nonlinear interactions can lead to longer groups of high waves than expected from linear theory. Using data from ONR-supported field experiments, Dr. Vanhoff demonstrated that his simulation technique modeled wave groups observed in intermediate and shallow water. Dr. Vanhoff is now a research assistant in Dr. M. Freilich's laboratory at Oregon State University. Dr. Vanhoff is working with signal processing of scatterometer data from the ADEOS satellite to investigate winds and waves over the global ocean.

Dr. Edith Gallagher received a PhD from the Scripps Institution of Oceanography for her studies of nearshore morphology. She showed that during storms sand bars are driven offshore by transport of suspended sediment by strong mean cross-shore directed currents. Her research has continued during her post doctoral studies at the Naval Postgraduate School with Dr. E. Thornton. Dr. Gallagher has been investigating seafloor bedforms in the nearshore observed during ONR-sponsored field experiments at Duck, North Carolina. As part of this ASSERT funding Dr. Gallagher helped develop a sonar altimeter for use in the surf zone that is being used by several research laboratories in the US and in Europe.

ONR-Sponsored Refereed Publications Written by the AASERT Students

Chandran, V., Steve Elgar, and B. Vanhoff, 1994 Statistics of tricoherence IEEE Signal Processing **42**, 3430-3440.

Vanhoff, B. and Steve Elgar, 1997 Simulating quadratically nonlinear random processes, International J. Bifurcation and Chaos **7**, 1367-1374.

Vanhoff, B., Steve Elgar, and R.T. Guza, 1997 Numerically simulating nonGaussian sea surfaces, ASCE J. Waterway, Port, Coastal, and Ocean Engineering **123**, 68-72.

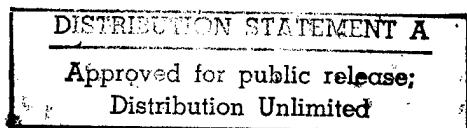
Elgar, Steve, B. Vanhoff, L. Aguirre, U. Freitas, and V. Chandran, Higher-order spectra of nonlinear polynomial models for Chua's circuit, International J. Bifurcation and Chaos, in press.

Gallagher, Edith, B. Boyd, Steve Elgar, R.T. Guza, B.T. Woodward, 1996 Performance of a sonar altimeter in the nearshore, Marine Geology **133**, 241-248.

Elgar, Steve, R.T. Guza, B. Raubenheimer, T.H.C. Herbers, Edith Gallagher, 1997 Spectral Evolution of Shoaling and Breaking Waves on a Barred Beach, J. Geophysical Research **102**, 15,797-15,805.

Gallagher, Edith, Steve Elgar, and R.T. Guza, 1998 Observations of Sand Bar Evolution on a Natural Beach, J. Geophysical Research **103**, 3203-3215.

Gallagher, Edith, Steve Elgar, and E.B. Thornton, 1998 Megaripple migration in a natural surfzone, Nature **394**, 165-168.



19990201 000

#### Conferences, Proceedings, Published Abstracts

Gallagher, E. L., S. Elgar, and R. T. Guza, Field test of a new sonic altimeter, *Eos Trans. AGU* **74**, 348, 1993.

Burnet, T., E. Gallagher, M. Okihiro, B. Raubenheimer, R. Whitsel, B. Vanhoff, S. Elgar, and B.T. Werner, Field observations of beach cusp formation, *EOS Trans. AGU* **75**, 336, 1994.

Gallagher, E. L., S. Elgar, and R. T. Guza, Observations and predictions of sand bar motion during Duck94, *Eos Trans. AGU* **76**, 282, 1995.

Elgar, S., R. T. Guza, B. Raubenheimer, T. H. C. Herbers, and E. Gallagher, Observations of wave evolution during Duck94, *Eos Trans. AGU* **76**, 282, 1995.

Gallagher, E., S. Elgar, and R. T. Guza, Observations of migrating megaripples, *Eos Trans. AGU* **77**, 387, 1996.

Gallagher, E., S. Elgar, and R. T. Guza, 1995 Observations of bathymetric evolution during Duck94, *Coastal Dynamics '95*, Gdansk, 46-50.

Gallagher, E. L., S. Elgar, and R. T. Guza, 1996 Observations and predictions of sand bar motion, 25th Intl. Conf. on Coastal Engineering, Amer. Soc. Civil Eng., Orlando, 78-79.

Vanhoff, B., S. Elgar, and R. T. Guza, Numerically simulating nonGaussian sea surfaces, *Eos Trans. AGU* **77**, 394, 1996.

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE 15 Jan 1999		3. REPORT TYPE AND DATES COVERED Final 1 June - 31 May 98
4. TITLE AND SUBTITLE AASERT: Observation and prediction of the nonlinear evolution of shoaling surface gravity waves			5. FUNDING NUMBERS N00014-95-1-0730	
6. AUTHOR(S) S. Elgar				
7. PERFORMING ORGANIZATION NAMES(S) AND ADDRESS(ES) Washington State University Pullman, WA 99164			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAMES(S) AND ADDRESS(ES) Office of Naval Research 800 N. Quincy Arlington, VA 2217			10. SPONSORING / MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES				
a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release			12. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words)  The two graduate students supported by this AASERT project completed their studies and were awarded PhDs. Dr. Barry Vanhoff received a PhD from Washington State University for his studies of techniques to simulate time series of nonlinear ocean surface waves. He showed that nonlinear interactions can lead to longer groups of high waves than expected from linear theory. Using data from ONR-supported field experiments, Dr. Vanhoff demonstrated that his simulation technique modeled wave groups observed in intermediate and shallow water.  Dr. Edith Gallagher received a PhD from the Scripps Institution of Oceanography for her studies of nearshore morphology. She showed that during storms sand bars are driven offshore by transport of suspended sediment by strong mean cross-shore directed currents. As part of this ASSERT funding Dr. Gallagher helped develop a sonar altimeter for use in the surf zone that is being used by several research laboratories in the US and in Europe.				
14. SUBJECT TERMS Waves, nonlinear waves, shoaling, surf zone			15. NUMBER OF PAGES 2	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UL	